

# Quantum Tunneling

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Tunneling is a quantum mechanical effect whereby a particle goes through, rather than over, an energy barrier. Although hydrogen tunneling plays an important role in many chemical and enzymatic reactions, the tunneling of heavier atoms such as oxygen and carbon is much less common. However, the investigators observed ring expansion of 1-methylcyclobutylfluorocarbene at 8 kelvin, a reaction that involves carbon tunneling. “The measured rate constants were  $4.0 \times 10^{-6}$  per second in nitrogen and  $4 \times 10^{-5}$  per second in argon. Calculations indicated that at this temperature the reaction proceeds from a single quantum state of the reactant so that the computed rate constant has achieved a temperature-independent limit. According to calculations, the tunneling contribution to the rate is 152 orders of magnitude greater than the contribution from passage over the barrier.”

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